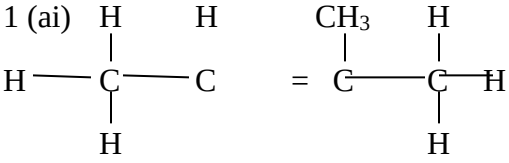
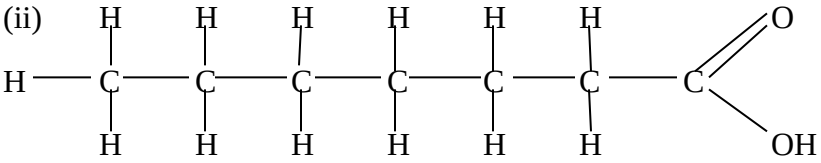
FORM 4

CHEMISTRY PAPER TWO

MARKING SCHEME

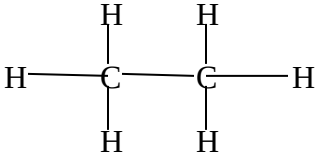
1 (ai)  1mrk

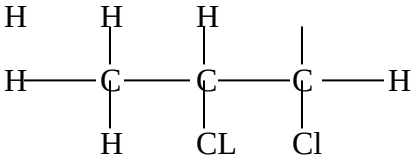
(ii)  1mrk

Accept open structural formula.

CH_3 may or may not be open.

OH may or may not be open.

(b) i) Ethane/ $C2\ H_6$  1mrk

(ii) $C_3\ H_6\ Cl_2$ 

(iii) 1) Water/ steam/ conc. $H_2\ SO_4$ 1mrk

2) Acidified $KMnO_4$ /$KMnO_4$/Acidified $K_2\ Cr_2\ O_7$ Any 1mrk

(ii) $2CH_3\ CH_2\ CH_2\ OH + 2Na \longrightarrow 2CH_3\ CH_2\ CH_2\ ONa + H_2$ 1 mrk

Ignore missing or wrong state symbols.

Penalize fully if not balanced.

(c) i) Oxidation 1mrk

ii) Decarboxylation 1mrk

(d) Cleansing agent has <u>polar end</u> ½ and non – polar end ½ Non – polar end <u>attracts ½ Grease</u> while polar end attracts water molecules ½ This lower the surface tension of water/ <u>emulsification of grease ½</u>

2(a) i) D has a lower melting point than F ½ because F has more valence electrons ½ and smaller atomic radius hence stronger metallic bonds which require a lot of energy to break.

ii) G has a larger atomic radius than N. N has more protons than G/ N has a greater nuclear attraction than G./ N has a more effective nuclear charge than G.

iii) D 1mrk; Has the largest atomic radius / thus loses it's outermost electrons most readily.

iv) Oxide of L is acidic ½ while that of C is basic/alkaline1/2 Oxide of L dissolves in water to form H^+ ions ½ while that of C dissolves in water to form OH^- ions ½

(b) i) M 1mrk

ii) L 1mrk

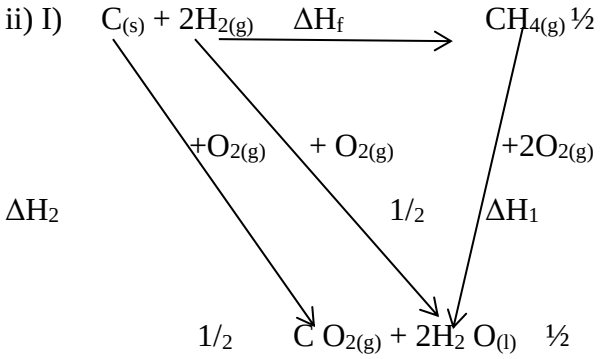
(c) In $SiCl_4$ molecules are joined together by weak van der waals forces ½ . Forming a simple molecular structure while in Mg Cl_2 ions are linked by strong ionic bonds / electrostatic forces of attraction ½ forming giant ionic structure ½

3 (a) i) Heat change that occurs when one mole of a substances is formed from its constituent elements (in their normal State) 1mrk

Or

Heat absorbed or evolved when one mole of a substance is formed from its constituent elements in their normal states.

ii) I)



Equation for CH_4 formation ½

Equation for CO_2 and H_2O combustion 1mrk

Equation for CH_4 combustion 1/2mrk Total= 2mrks

II) $\Delta h_f = \Delta H_2 - \Delta H_1$

$= -393 + 2(-286) + 890$

$=-75kJMol^{-1}$

Penalize ½ for wrong or missing units.

(b) i) Plotting

9 correct plots	1
8 correct plots	½
< 8 correct plots	0

Scale

Horizontal scale –	½
Vertical scale	½
Line Extrapolation	½
Inverted	½

ii) I) Value read from graph = ½

II) Acid volume from graph ½

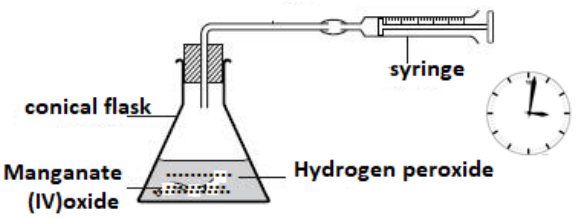
Base volume = $50cm^3$ acid volume from graph ½

iii) ΔT value (Final Temp from graph -25^0C) ½

(c) NH_3 is <u>a weak</u> base hence some of the heat evolved is used to <u>completely ionize</u> $NH_{3(aq)}$

4 (a) measure of how much of the reactants are consumed or how much products are formed per unit time.

(b)



(c) i) Reaction in which rate of forward reaction is equal to the rate of reverse/ backward reaction. 1mrk

ii)

(d) i) Crush(1mrk) the seeds using a mortal and pestle, add suitable solvent such as propanone / acetone/ ethanol/ propanol ½ and continue crushing. The liquid is filtered / decanted/sieved ½ in an evaporating dish. The dish is placed out into the sun to allow the solvent to evaporate leaving the oil behind. ½

ii) The liquid left after evaporation is placed on apiece of paper. If it leaves a translucent mark then it approves it is oil.

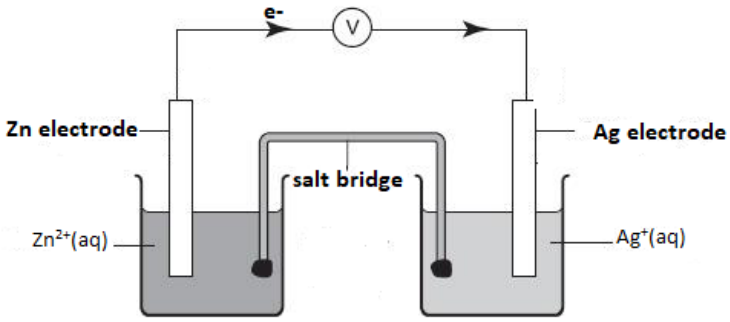
5 (a) i) $Ag/Ag^{+}_{(aq)}$ and $Zn_{(s)}/Zn^{2+}_{(aq)}$ Or 1mrk

$Zn/Zn^{2+}_{(aq)} // Ag^{+}_{(aq)}/Ag_{(s)}$ 1mrk

Or

Zn and Ag half cells.

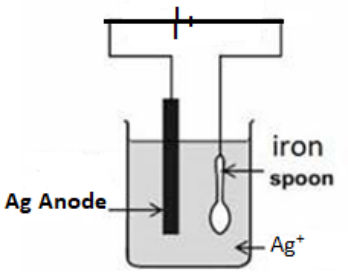
ii)



iii) $Zn_{(s)}/Zn^{2+}_{(aq)}//Ag^{+}_{(aq)}/Ag_{(s)}$ 1mrk

iv) Completes the circuit 1mrk
Maintains charge balance 1mrk
Replenishes the used ions in the two half cells

(b) i)



Workability ½

I Q = It

= 4 x 30 x 60 ½

= 7200C ½ *Penalize if missing units.*

II) 2.34g ⟶ 7200C

65g ?

$= \frac{65g \times 7200C}{2.34g}$ ½

=200 000C ½

6 i) $MnO_{2(s)} + 4HCl_{(aq)} \longrightarrow MnCl_{2(aq)} + Cl_{2(g)} + 2H_2O_{(l)}$ 1mrk

ii) $KMnO_{4(s)}$/ $PbO_{2(s)}$ / $CaOCl_{2(s)}$

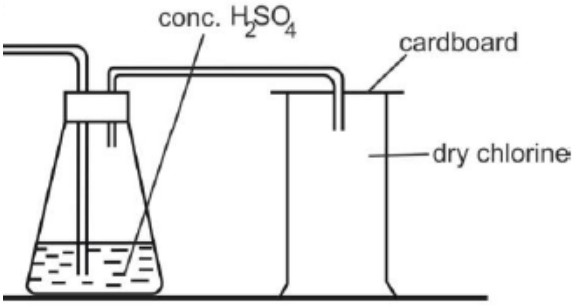
iii) By passing $Cl_{2(g)}$ through a U – tube containing anhydrous $CaCl_2$

Drying agent 1mrk

Suitable Apparatus 1mrk

By passing $Cl_{2(q)}$ through concentrated H_2SO_4 in a flask or bulling tube.

Or



(b) i) Aluminum chloride/Al Cl_3

ii) $2Al_{(s)} + 3Cl_{(s)} \longrightarrow 2AlCl_{3(g)}$/ $Al_2Cl_{6(g)}$

iii) Mol Al used = $\frac{0.84}{27}$ = 0.0311 1 mrk

Mol of Cl_2 = $\frac{0.0311 \times 3}{2}$ = 0.047 1 mrk

Volume of Cl_2 = 0.047 x 24 = 1.12 dm^3

Or

$\frac{0.84}{27}$ x 3 x 24 = 1.12dm^3 3mks

This part is consequential to part iii)

If more raha not used give a maximum of 2mrks

iv) Prevent moisture from entering its apparatus by absorbing it/ prevent hydrolysis of $AlCl_2$

To react with excess Cl_2 / preventing environmental pollution by Cl_2.

7 (a) i) Magnetite/ Siderite 1 mrk

ii) Carbon (ii) oxide 1mrk

iii) React with coke/charcoal / carbon to form carbon (iv) Oxide

Rise the temperature at the bottom of the finance to about 200K (165^0C)

(b) A; $C(s)+O_{2(g)} \longrightarrow CO_{2(g)}$ 1mrk

B; $Fe_2O_{3(s)} + 3CO_{(g)} \longrightarrow 2Fe_{(s)} + CO_{2(s)}$ 1mrk

C; $CaCo_{3(s)} \longrightarrow CaO_{(s)} + CO_{2(g)}$ 1mrk

(c) Decompose to quick lime (calcium oxide) which react to remove impurities and produce more carbon (iv) oxide gas.

(d) $CaO + Si\,O_{2(s)} \rightarrow Ca\,Si\,O_{3(s)}$ 1mrk

$CaO + Al_2O_{3(s)} \rightarrow Ca\,Al_2O_{4(s)}$ 1mrk

All Equations must be balanced and with correct state symbols

(e) Carbon (iv) Oxide gas causes global warming if allowed to escape. 1mrk

Carbon (iv) Oxide is highly poisonous/ toxic that can kill.